1. 113(7) : The Orbits of Charged Masses

In ECE theory we have introduced the principle of the equivalence of mass and charge:

$$m^2 = \frac{e^2}{4\pi\epsilon_0 G} \quad -(1)$$

so:

$$\boxed{e = \pm\, 4\pi\epsilon_0 G m} \quad -(2)$$

In nature there appears to be one sign of mass but two signs of charge, as in eq. (2).

From note 113(6) it is possible to write down the Newton / Coulomb law from the spherical symmetry of spacetime:

$$\boxed{V = -\frac{m^2 G}{r} = -\frac{e^2}{4\pi\epsilon_0 r}} \quad -(3)$$

The centripetal law is:

$$\boxed{V = \frac{1}{2} m \frac{L^2}{r^2} = \frac{1}{2} \frac{e}{(4\pi\epsilon_0 G)^{1/2}} \frac{L^2}{r^2}} \quad -(4)$$

and the relativistic law is:

$$\boxed{V = -\frac{L^2 m^2 G}{c^2 r^3} = -\frac{L^2}{c^2 r^3} \cdot \frac{e^2}{4\pi\epsilon_0}} \quad -(5)$$

2) Interpretation

Equations (1) and (2) must be interpreted to mean the mass due to charge. In an electrically neutral body the two signs of charge cancel out. Eq (2) defines the equivalent elementary mass of the charge on the proton (e) or electron (−e). The neutron has no electric charge and so has no equivalent mass due to electric charge. Experimentally there appears to be one sign of mass and masses always attract. There are two signs of charge, and charges can attract and repel. So m in eq (2) is positive, but e is either positive or negative.

Equation (3) means that the Coulomb law and Newton law are equivalent, they are due to the spherical symmetry of spacetime.

Equation (4) introduces a new law of physics, the centripetal law of charge interaction.

Equation (5) is also a new law of physics, the relativistic law of charge interaction.

These laws come from the ECE hypothesis:

$$\boxed{A = A^{(0)} q} \quad - (6)$$

Examples

The constants are:

$$G = (6.6726 \pm 0.005) \times 10^{-11} \ Nm^2 kg^{-2}$$

$$\epsilon_0 = 8.854188 \times 10^{-12} \ J^{-1} C^2 m^{-1}$$

So if one coulomb of charge is considered in eq. (2):

$$e = 1 \ \text{Coulomb} \quad - (7)$$

then about 10^{23} kilograms of mass are needed. This is interpreted to mean that the equivalent mass contained in one coulomb of electric charge is about 10^{23} kilograms. Therefore the electric field of force in the laboratory is 10^{23} orders of magnitude stronger than the gravitational field. Conversely, one kilogram of mass is equivalent to about 10^{-23} Coulombs of charge.

Experimentally, the laws in eqs. (3) to (5) are mutually exclusive, if two charged masses are considered, changing the mass has no effect on the Coulomb law, changing the charge has no effect on the Newton law. Any interaction must occur through spin connection resonance.

4) Relativistic Correction to the Coulomb Law

This is:

$$V = -\frac{e^2}{4\pi\epsilon_0}\left(\frac{1}{r} + \frac{L^2}{c^2 r^3}\right) \quad -(8)$$

where the constant of motion is:

$$L = r^2 \frac{d\phi}{d\tau} \quad -(9)$$

Eq (8) parallels the relativistic correction to the Newton law:

$$V = -m^2 G\left(\frac{1}{r} + \frac{L^2}{c^2 r^3}\right) \quad -(10).$$

The relativistic correction to the Coulomb law is:

$$\boxed{V = -\frac{e^2}{4\pi\epsilon_0}\left(\frac{1}{r} + \frac{r}{c^2}\left(\frac{d\phi}{d\tau}\right)^2\right)} \quad -(11)$$

so for r of one metre, the rate of change of angle $d\phi / d\tau$ would have to be very high to observe it in one charged mass orbiting another. Eq (11) could be inputted in density functional code to compute the effect on spectra.